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TRANSMITTAL OF APPEAL BRIEF

Docket No.
70071.00004

In re Application of: Edward Pope

Application No.
10/058,808

Filing Date
January 28, 2002

Examiner
Margaret G. Moore

Group Art Unit
1712

Invention: PRECERAMIC POLYMERS TO HAFNIUM CARBIDE AND HAFNIUM NITRIDE
CERAMIC FIBERS AND MATRICES

TO THE COMMISSIONER OF PATENTS:

Transmitted herewith is the Appeal Brief in this application, with respect to the Notice of Appeal
filed: January 31, 2005

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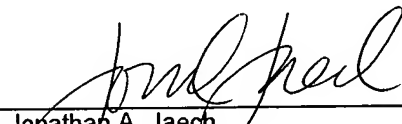
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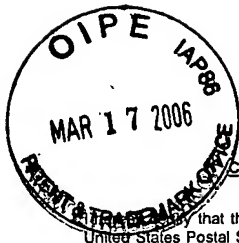
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Jonathan A. Jaech
Attorney Reg. No. 41,091

Dated: March 14, 2006

Connolly Bove Lodge & Hutz LLP
355 South Grand Avenue
Suite 3150
Los Angeles, CA 90071-1560
(213) 787-2500

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PATENT
70071-00004 (POPE#6(CIP)3)

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicants: Edward Pope

Serial No.: 10/058,808

Filed: January 28, 2002

Title: PRECERAMIC POLYMERS TO
HAFNIUM CARBIDE AND HAFNIUM NITRIDE
CERAMIC FIBERS AND MATRICES

Art Unit: 1712

Examiner: Margaret G. Moore

APPEAL BRIEF

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Sir or Madam:

The appellant filed a Notice of Appeal in the above-identified application on 31 January 2005 under 35 U.S.C. § 134(a), and submits this Appeal Brief under 37 CFR 1.192 (hereinafter "Rule 192"). An earlier appeal brief was filed on May 2, 2005, but was rejected as untimely in a communication mailed on July 26, 2005. The entire delay from the time the Appeal Brief was due until now was unintentional, and a Petition to Revive accompanies this communication. The Appeal Brief presently submitted

meets the substantive requirements of Rule 192. The appellant requests entry, consideration, and favorable action on this appeal at the Office's earliest convenience.

In accordance with Rule 1.192(c), the appellant presents the following items under the headings prescribed therein.

Real Party in Interest

MATECH Global Strategic Materials, Inc., a California corporation, owns the subject application.

Related Appeals and Interferences

Neither the assignee nor the appellant are aware of any other appeals or interferences that would bear on the Board's decision in this appeal.

Status of Claims

On January 31, 2005, the appellant filed a Notice of Appeal from the final rejections of pending claims 7-8 as stated in the Official Action mailed on September 27, 2004 (hereinafter the "Final Action"). Claims 1-6 were previously cancelled. Both of claims 7-8 have been finally rejected.

Status of Amendments

The amendment mailed May 2, 2005 has been denied entry.

Summary of Invention

The invention is directed to a ceramic fiber product comprising or consisting of hafnium carbide. Hafnium carbide is known as a useful ceramic material for very high temperature applications. Prior to the invention, hafnium carbide fibers having the

qualities provided by the process of the invention were not available. Generally, hafnium carbide (HfC) was conventionally prepared by hot-pressing to obtain monolithic HfC ceramics and CVD to obtain coatings. No HfC fibers have ever been prepared from preceramic polymers. Claim 7 defines a hafnium carbide ceramic fiber such as formed by a defined process. The process comprises the particular steps of:

A. Melting a hafnium-containing pre-ceramic polymer. Page 72, lines 12-18.

B. Extruding said polymer through an orifice to form fiber. Page 72, line 18 – page 73, line 6.

C. Cross-linking said fiber. Page 73, lines 8-10.

D. Heating said cross-linked fiber under controlled atmospheric conditions at temperature greater than 600 degrees centigrade to obtain a hafnium carbide containing ceramic fiber. Page 73, lines 10-14; page 74, lines 2-12.

Claim 8 defines a ceramic fiber comprising hafnium carbide derived from a pre-ceramic polymer. Pages 72-74.

Grouping of Claims

The appellants group the rejected claims as follows:

Group I: Claims 7;

Group II: Claim 8.

The claims within each of the above groups stand or fall together with respect to the pending rejections. If the claims were to be rejected on grounds other than presently pending, the above grouping may not apply. In the arguments below, the appellants present reasons why each of the above group of claims is separately patentable over the cited references.

Issues

The appellants address the following issues in the arguments presented below with respect to the group of claims identified above:

1. Whether claim 7 (Group I) is patentable under 35 U.S.C. § 103(a) over Hilmas (U.S. Pat. No. 6,355,338).
2. Whether claim 7 (Group I) is patentable under 35 U.S.C. § 102(b) over Hilmas (U.S. Pat. No. 6,355,338).
3. Whether claim 8 (Group I) is patentable under 35 U.S.C. § 102(b) over Uemura (U.S. Pat. No. 5,399,378).

Argument

Anticipation

MPEP § 2131 states the basic requirements for a case of anticipation under § 102 as follows:

To anticipate a claim, the reference must teach every element of the claim. "A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single

prior art reference." *Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987). "When a claim covers several structures or compositions, either generically or as alternatives, the claim is deemed anticipated if any of the structures or compositions within the scope of the claim is known in the prior art." *Brown v. 3M*, 265 F.3d 1349, 1351, 60 USPQ2d 1375, 1376 (Fed. Cir. 2001) . . . See also MPEP § 2131.02. "The identical invention must be shown in as complete detail as is contained in the ... claim." *Richardson v. Suzuki Motor Co.*, 868 F.2d 1226, 1236, 9 USPQ2d 1913, 1920 (Fed. Cir. 1989).

When assessing patentability of a product-by-process claim, the structure implied by the process steps should be considered. This is especially true where the product can only be defined by the process steps by which the product is made, or where the manufacturing process steps would be expected to impart distinctive structural characteristics to the final product. See, e.g., *Atlantic Thermoplastics Co. v. Faytex Corp.*, 970 F.2d 834, 845 (Fed. Cir. 1992); M.P.E.P. § 2113.

Obviousness

MPEP § 2143 states the basic requirements for a *prima facie* case of obviousness under § 103(a) as follows:

"To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference

teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations.

The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, not in applicant's disclosure. *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991)."

Furthermore, a prior art reference must be considered in its entirety, that is, as a whole, including portions that would lead away from the claimed invention. M.P.E.P. § 2141.02; *Bausch & Lomb v. Barnes-Hind/Hydrocurve, Inc.*, 796 F.2d 443, 448, 230 USPQ 416, 420 (Fed. Cir. 1986). As the Court in *Bausch & Lomb* affirmed, "[i]t is impermissible within the framework of section 103 to pick and choose from any one reference only so much of it as will support a given position to the exclusion of other parts necessary to the full appreciation of what such reference fairly suggests to one skilled in the art. " *Id.*, citing *In re Wesslau*, 353 F.2d 238, 241, 147 USPQ 391, 393 (CCPA 1965). Among other things, it is improper to combine references without consideration for parts of the references that would have led one of ordinary skill away from the invention. *Ashland Oil, Inc. v. Delta Resins & Refractories, Inc.*, 776 F.2d 281, 296-297, 227 USPQ 657, 669 (Fed. Cir. 1985); M.P.E.P. § 2145(X)D(2). Even if the cited references themselves do not expressly teach away from the invention, the prior art must be considered as a whole, as it would have been viewed by one of ordinary skill in the art. *In re Hedges*, 783 F.2d 1038, 1041, 228 USPQ 685, 687 (Fed. Cir.

1986). "Evidence that supports, rather than negates, patentability must be fairly considered." *In re Dow Chemical Co.*, 837 F.2d 469, 473, 5 USPQ.2d 1529, 1533 (Fed. Cir. 1988).

The present rejections of the claims under 35 U.S.C. § 103(a) are based on a reference that does not teach or suggest all of the claimed limitations. In addition, the evidence as a whole does not suggest the proposed modification of the prior art reference. Instead, the deficiencies of the reference have been ignored to reconstruct the invention using hindsight.

A. Group I

Rejection under 35 U.S.C. § 103(a) over Hilmas

The hafnium carbide fiber product defined by claim 7 is distinct from the co-extruded fiber disclosed by Hilmas. As defined by claim 7, hafnium is contained in a pre-ceramic polymer that is extruded, then crosslinked, and then pyrolyzed to obtain hafnium carbide. Hilmas fails to disclose or suggest at least two important elements of this process, and discloses a distinctly different process with a different result.

First, Hilmas fails to disclose or suggest melting a hafnium containing pre-ceramic polymer. Hilmas discloses instead extruding particles of hafnium *carbide* in a thermoplastic resin matrix. Col. 11, lines 58-62. The acryloid resin disclosed by Hilmas is plainly not a pre-ceramic polymer because the hafnium carbide is already formed when the thermoplastic resin is melted and extruded. That is, the hafnium carbide is

added as a powder *prior* to the melt step, and thus, Hilmas fails to disclose or suggest melting of a pre-ceramic polymer.

Second, Hilmas fails to disclose or suggest any step of cross-linking a hafnium containing polymer prior to pyrolysis. The Final Action states that the cross-linking limitation "does not appear to lend any distinction to the final claimed product per se," but this statement is unsupported by any authority and is, in fact, erroneous. It should be apparent that the cross-linking step is, in fact, essential to preparation of the final structural ceramic fiber. The specification consistently includes cross-linking in every example, and further describes an insufficient amount of cross-linking as problematic. Page 72, lines 2-4. Without adequate cross-linking, sublimation occurs during pyrolysis and ceramic yield is reduced. *Id.* In contrast, no cross-linking is disclosed by Hilmas, because the hafnium carbide is already in the mixture *prior* to pyrolysis. In the process defined by claim 7, the hafnium carbide is formed *during* pyrolysis, resulting in a structural ceramic fiber.

It is further apparent that the ceramic product produced by the process of Hilmas is not a structural ceramic fiber, as it must be carried by a core structural fiber, such as the carbon fiber disclosed in Example 1. Col. 12, lines 1-2; col. 5, lines 14-38. Therefore, the defined process results in a product with distinct properties from the prior art.

The appellant respectfully submits that the § 103(a) rejections of the Group I claims as unpatentable over Hilmas fail to state a *prima facie* case of obviousness. Hilmas fails to teach or suggest the process steps as recited in claim 7 as required by MPEP § 2143 and legal precedents, and the defined process results in a structural ceramic fiber with novel properties. M.P.E.P. § 2113. Therefore, failing to disclose or suggest all the elements of claim 7, Hilmas presents no bar to patentability under 35 U.S.C. § 103.

Rejection under 35 U.S.C. § 102(b) over Hilmas

As explained in the foregoing section, Hilmas does not teach the claimed process steps of melting a hafnium containing pre-ceramic polymer, and cross-linking the fiber prior to heating the fiber to above 600° C. In addition, the process defined by claim 7 results in a ceramic fiber with novel properties. A showing of anticipation under § 102(b) requires finding each and every element of the claim disclosed or inherent in a single prior art reference. Therefore, failing to teach every element of claim 7, Hilmas presents no bar to patentability under 35 U.S.C. § 102.

B. Group II

Rejection under 35 U.S.C. § 102 over Uemura

Claim 8 defines “[a] ceramic fiber comprising hafnium carbide derived from a pre-ceramic polymer.” Three distinct elements are required: (1) a ceramic fiber; (2) the

ceramic fiber must comprise hafnium carbide; and (3) the hafnium carbide must be derived from a pre-ceramic polymer. Uemura fails to teach any of these elements.

Instead Uemura discloses a *carbon* fiber on which a heat-resistant carbide coating is formed “at the surface portion alone of the carbon fibers or together with part of an inner layer of the fibers,” by reacting the carbon fiber at high temperature with a carbide-forming compound. The resulting product is a carbon fiber with a ceramic coating or layer; it is not reasonably considered to read on a “ceramic fiber” based on a the plain meaning of the claim terms as would be understood by one of ordinary skill. “The person of ordinary skill in the art is deemed to read the claim term not only in the context of the particular claim in which the disputed term appears, but in the context of the entire patent, including the specification.” *Phillips v. AWH Corp.*, 415 F.3d 1303, 1313 (Fed. Cir. 2005)

The specification consistently refers in every instance and example only to fibers that are made by hydrolyzing an entire pre-ceramic polymer, such that the end product consists substantially entirely of a ceramic material – a structural ceramic fiber. See, e.g., p. 73, lines 7-14. Further in view of its plain meaning, a ceramic fiber (or a ceramic *anything*, for that matter) is expected to be made principally of ceramic, just as a wooden chair is made principally of wood. A carbon fiber as disclosed by Uemura, whether derived from pitch or polyacrylnitrile, is unquestionably not a “ceramic” fiber.

Likewise, Uemura discloses a composite carbon fiber with a ceramic layer formed by reacting the carbon fiber with a carbide-forming compound. It should be apparent that the process disclosed by Uemura would not change the principal constituent of the carbon fiber. To the contrary, Uemura teaches against making the carbide layer too thick as this would result in undesirable weight increases:

The thickness of the carbide film is normally 2 μm or less, preferably 1 μm or less, more preferably 0.01-0.3 μm , in which instance its weight increases should be held to 15% or less, preferably 10% or less, more preferably 5% or less.

Col. 2, lines 41-46. In comparison, the carbon fiber diameter is about 9.4 μm . See, e.g., Example 1. Therefore, Uemura also does not teach a ceramic fiber comprising hafnium carbide, and instead teaches a carbon fiber having a carbide layer.

Finally, Uemura also fails to teach a ceramic fiber that is derived from a pre-ceramic polymer, or from any other kind of polymer. It should be apparent from the ordinary meaning of "polymer" that carbon is not a polymer. According to one dictionary definition, a polymer is "[a]ny of numerous natural and synthetic compounds of usually high molecular weight consisting of up to millions of repeated linked units, each a relatively light and simple molecule." The American Heritage® Dictionary of the English Language, 4th Ed., 2000, Houghton Mifflin Co. (www.dictionary.com). As one of ordinary skill would know, a carbon fiber is made up of elemental carbon, not repeated linked molecular units, and is therefore not a polymer. Uemura teaches exposing the carbon fiber to a carbide-forming compound at high temperature, thereby causing

carbide to form at the surface of the carbon fiber. This carbide is not in any sense derived from a polymer; instead, it is formed by reaction of a compound with a carbon fiber. In contrast, the present application teaches hydrolyzing a polymer fiber to derive the hafnium carbide ceramic fiber. Such a process plainly reads on the term "derived from a pre-ceramic polymer," while the process disclosed by Uemura does not, for the reasons explained above.

Therefore, failing to teach every element of claim 8, Uemura presents no bar to patentability under 35 U.S.C. § 102.

Conclusion

Appellants respectfully request the reversal of the rejection of currently pending claims 7-8, and allowance of these claims forthwith, for the reasons set forth above.

Appendices

Appealed Claims 7-8 are attached hereto as Appendix A. Evidence for consideration in this appeal is attached hereto as Appendix B.

Respectfully submitted,

Date: March 14, 2006


Jonathan Jaech
Attorney for Applicant
Registration No. 41,091

**CUSTOMER
NUMBER**

58688

PATENT TRADEMARK OFFICE

Connolly Bove Lodge & Hutz LLP
355 South Grand Avenue
Suite 3150
Los Angeles, CA 90071-1560
(213) 787-2500

APPENDIX A
APPEALED CLAIMS

1-6. (Canceled)

7. (Previously Presented) Hafnium carbide containing ceramic fiber derived from a pre-ceramic polymer formed by a process comprising the steps of:

- a. melting a hafnium containing pre-ceramic polymer;
- b. extruding said polymer through an orifice to form fiber;
- c. cross-linking said fiber; and
- d. heating said cross-linked fiber under controlled atmospheric conditions at a temperature greater than 600 degrees centigrade to obtain a hafnium carbide containing ceramic fiber.

8. (Previously Presented) A ceramic fiber comprising hafnium carbide derived from a pre-ceramic polymer.

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APPENDIX B
EVIDENCE

NONE.